# *INSTRUCTION MANUAL*

FOR

PRECISION DC VOLTMETER

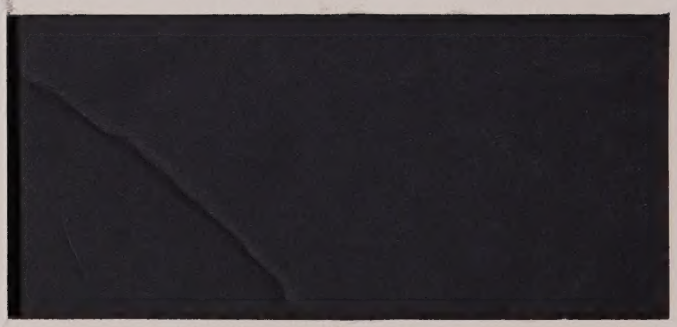
MODEL DC-100BR

Serial 3208

BT 1510616

*ELECTRONIC INSTRUMENTATION FOR INDUSTRY*

CALIBRATION STANDARDS CORPORATION *a subsidiary of* **ROYAL INDUSTRIES, INC.**



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# PRECISION DC VOLTMETER

## MODEL DC-100BR

Serial 3208

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CALIBRATION STANDARDS CORPORATION

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## IMPORTANT

FOR OPTIMUM RESULTS, PLEASE READ THE INSTRUCTION MANUAL CAREFULLY.

This instrument you have purchased represents a major advance in the field of transistorized precision test equipment.

Since this instrument incorporates the latest engineering techniques and design, it is imperative that you become familiar with the proper operating procedure.

Meter zeroing adjustment is performed at the factory. Normally no further adjustment is required. Should adjustment be necessary, the meter may be zeroed by the mechanical adjustment screw on the meter itself while the instrument is operating.

# OPERATING INSTRUCTIONS

1. The line cord should be plugged into a 117-volt 60-cycle power source. (220 volt if indicated)
2. Turn the null selector to TVM position and power switch on. Let the instrument warm up for approximately 10 minutes.
3. Check mechanical zero of meter. If necessary, adjust to zero by means of the screw in the center of the meter case.
4. Turn the range selector knob to the desired range. Connect the voltage to be measured to the terminal posts. Either positive or negative may be grounded to the common terminal. When operating with the polarity switch in the positive mode, the negative terminal is generally grounded to the case or left floating and in the negative mode, the reverse.
5. The voltage now indicated on the meter is accurate within 4%. If the meter needle swings to the left, turn the polarity switch to the NEG position.
6. Position first two readout dials to the approximate TVM voltage reading. Advance the null selector knob to the 1 V position. Continue to adjust the readout while increasing the null sensitivity. You are now zeroing in on the null.
7. When, by the procedure above, the null selector is at full sensitivity (1 MV) and the meter reading zero, the voltage read from the dials is accurate to better than the rated accuracy of the instrument. Because the sensitivity of your instrument in the 1 MV null position is higher than the stability of many sources, you may not get a reading of zero if the voltage you are measuring is not constant and is fluctuating.

OPERATING INSTRUCTIONS (Continued)

READING EXCURSIONS ABOUT A NOMINAL VOLTAGE

8. To read excursions of voltage about a nominal value, set the readout dials to the nominal value. Excursions may be observed directly on the meter on any of the four null ranges. A right hand deflection of the meter indicates the voltage has increased above the nominal value by the amount indicated on the meter. For voltages read on the 10-volt range and below, use null sensitivity selector as marked. On the 100-volt ranges, the null sensitivity selector value must be multiplied by a factor of 10. On the 1000-volt range the null sensitivity selector value must be multiplied by a factor of 100.

DIRECT MEASUREMENTS OF 10 VOLTS AND ABOVE

9. With the range selector in the 10-volt position, use full scale values as marked on the meter. When range selector is in the 100-volt position, multiply the meter reading by 10. On the 1000-volt range, multiply the reading by 100.

VARIATIONS IN NULL DETECTOR SENSITIVITY

10. Due to the circuit design on the 100-volt range, the null detector will have reduced sensitivity on the 1 mv and 10 mv positions. This is due to a high internal source impedance of the high voltage input divider. The sensitivity is about 50% less in the 1 mv null position and about 15% less on the 10 mv position. Only a very slight loss of sensitivity is noticed on the other null ranges. When the range selector is in the 1000-volt position, a 10% loss of sensitivity will be noticed in the 1 mv position.

The other null ranges will have only a very slight loss of sensitivity.

MEASUREMENTS BELOW 1 VOLT IN DIFFERENTIAL MODE

11. When making measurements below 1 volt, turn Range Selector switch to the 1-volt position. Set null selector to the 1 mv position. Set all readout dials to zero and short positive and negative input terminals together.

12. Now set the mechanical meter adjustment to zero. This will cancel out error due to zero offset between the 1 millivolt range and the VTVM range. Remove short across terminals and proceed with the reading of voltage per paragraphs 4, 5, 6, and 7.

"POS" AND "NEG" POLARITY

13. This instrument is capable of measuring both positive and negative voltages without reversing the input connections, by setting the polarity switch in the correct position.

Under some conditions the reading in the "NEG" position may differ from the "POS" position. This difference is very small in comparison to the rated accuracy of the instrument. Since the instrument is calibrated in the "POS" position, the best accuracy will result when the polarity switch is in this position.

OPERATING INSTRUCTIONS (Continued)

RECORDER OUTPUT

14. Two sets of output terminals are located on the rear of the voltmeter. One set is the recorder output and the other is the Kelvin-Varley output. The output voltage of the recorder output terminals is ±25 mv for a full scale deflection. The output impedance is approximately 200Ω. Any recorder may be used so long as the leakage resistance to the line or ground is better than 10,000 megohms.

When using high speed recorders, it may be necessary to install a filter between the output terminals of the voltmeter and the input of the recorder. The output signal of the voltmeter will have the demodulated chopper signal and must be filtered out. Generally a three-stage RC filter using 33K resistors and 1 mfd capacitors will be sufficient.

KELVIN-VARLEY OUTPUT

15. The second set of terminals provide an output from the Kelvin-Varley Divider. The maximum output is 10 vdc when the instrument range selector is in the 10-volt position. A chart showing the output impedance of the KVD is located in the back of this manual.

# CIRCUIT DESCRIPTION

This Calibration Standards Corporation Voltmeter is completely transistorized and designed for long, trouble-free life. There are no batteries or components that would normally need replacing.

This dependable voltmeter operates on the principle of comparing an unknown voltage with an adjustable known voltage. A sensitive null detector is used to provide a means of sensing when the known and unknown voltages are equal.

This Calibration Standards Corporation Voltmeter is composed of three basic elements:

(1) An ultra stable reference supply.

(2) An accurate Kelvin-Varley divider.

(3) A sensitive null detector.

CIRCUIT DESCRIPTION (Continued)

1. The heart of the voltmeter is the ultra stable reference voltage supply. This supply is a dual regulated transistor supply powering a compensated Zener reference string. The transistors and Zener diodes are silicon, and therefore will withstand high temperatures without impairing the life of the assembly. Following is a performance chart of the references.

| Model | Regulation for 10% line change | Temperature Coefficient 15°C to 40°C | Long-term stability of Zener Element Typical | Maximum |
|---|---|---|---|---|
| DC-210B/BR | ±0.001% | * | ±10 ppm | ±20 ppm |
| DC-200B/BR | ±0.001% | ±2 ppm/°C | ±10 ppm | ±20 ppm |
| DC-150B/BR | ±0.001% | ±3 ppm/°C | ±10 ppm | ±20 ppm |
| DC-110B/BR | ±0.002% | ±5 ppm/°C | ±20 ppm | ±40 ppm |
| DC-100B/BR | ±0.005% | ±5 ppm/°C | ±20 ppm | ±50 ppm |

This reference voltage supply is constructed as a printed circuit assembly. Spares and replacements are available from the factory. When ordering, be sure to indicate the serial number of the instrument.

*The Zener reference is enclosed in a proportional control oven holding the temperature to better than ±0.1°C.

CIRCUIT DESCRIPTION (Continued)

2. The second basic element is the very accurate Kelvin-Varley Divider. All readout decks except the last have 11 carefully matched precision wirewound resistors. The chart below shows the maximum Kelvin-Varley Divider linearity and yearly stability.

| Model | Linearity | Maximum Stability | Typical Stability |
|---|---|---|---|
| DC-210B/BR | ±20 ppm | ±5 ppm | ±1-2 ppm |
| DC-200B/BR | ±20 ppm | ±5 ppm | ±1-2 ppm |
| DC-150B/BR | ±25 ppm | ±5 ppm | ±1-2 ppm |
| DC-110B/BR | ±75 ppm | ±20 ppm | ±3-5 ppm |
| DC-100B/BR | ±100 ppm | ±20 ppm | ±4-8 ppm |

Since the divider resistors operate at very low power ratings, the long-term stability of the divider is that of the long-term ratio stability at shelf-life. The resistors are preaged and tested for best stability before installation in the instrument.

The resistors used in the first deck of the DC-210B/BR, DC-200B/BR, and DC-150B/BR Kelvin-Varley Divider are the most stable type of resistor possible to manufacture. They are wound with very little strain and are sealed in silicon oil. Resistors of this type are also utilized in the range divider network.

The range selector precedes the Kelvin-Varley Divider. Each range has a fine adjustment potentiometer for calibration. Each is calibrated separately.

## CIRCUIT DESCRIPTION (Continued)

3. The third element is a very sensitive and stable calibrated null detector. This null detector is used to indicate the difference between an unknown external voltage and a known internal voltage. At maximum sensitivity the null detector has a full-scale deflection of 1 mv. This provides ample sensitivity for accurate low-level voltage measurements. The TVM accuracy is ±4% of full scale over a temperature range of 10°C to 40°C. The instrument is usable to 50°C but some derating should be considered.

The null detector is capable of a long, trouble-free life except for the occasional replacement of the chopper. These are highly reliable, however, do occasionally need replacement. Choppers are available from stock at the factory. The occasional calibration of the null detector may be made by adjusting the gain-adjustment potentiometer, R32, located in the amplifier printed circuit board. An electrical zero control, R31, is also located on this board.

The null detector is capable of large overloads without damage. On the 1 mv range a safe overload would be 50 volts short-term and 10 volts long-term. On the 10 mv, 100 mv, and 1V positions, a safe overload of 500 volts is possible.

## CIRCUIT DESCRIPTION (Continued)

In the VTVM position ranges, safe overloads are as follows.

| | |
|---|---|
| 1-volt range: | 70 volts |
| 10-volt range: | 250 volts |
| 100-volt range: | 700 volts |
| 1000-volt range: | 1500 volts |

# CALIBRATION

Refer to "Suggested Calibration Set-up" diagram.

A. CALIBRATION OF THE DIFFERENTIAL SECTION

The "RANGE SELECTOR" - "10V" range is calibrated first. On this range the instrument has an infinite input resistance at null.

1. Check mechanical zero of meter. If necessary, adjust to zero by means of the screw in the center of the meter case.
2. Next, turn "NULL SELECTOR" to the TVM position and power switch on. Check electrical zero of meter. If necessary, adjust to zero by means of R31.
3. Apply a known 10-volt calibration voltage across the "POS" and "NEG" input terminals. The instrument meter should read full scale. Turn "READOUT" dials to read (9). (9) (9) (9) (10) and turn "NULL SELECTOR" switch to the "1 MV" position. Bring meter to zero by adjusting the appropriate calibration trim potentiometer. (See calibration board component layout.)
4. Repeat the basic procedure for calibration of the "1V" range using a known 1 volt. Repeat the basic procedure for calibration of the "'00 mv" range using a known 100 mv source. (Omit where not applicable.)
5. The "RANGE SELECTOR" - "100V" and "1000V" ranges are calibrated next. On these ranges the instrument has a 2 megohm input resistance.
6. Turn the "RANGE SELECTOR" switch to the "100V" position and apply a known 100-volt calibration voltage at meter input. Continue basic calibration procedure outlined in Paragraph 3.

Note: Multiply "NULL SELECTOR" ranges by 10.

CALIBRATION (Continued)

7. Turn the "RANGE SELECTOR" switch to the "1000V" position. Apply a known 500 volts with the "READOUT" dials turned to (5) (0) (0) (0) (0) (0). Bring meter to zero by adjusting the appropriate trim potentiometer.

B. CALIBRATION OF THE TVM RANGES

Calibrate the TVM Ranges by setting the "RANGE SELECTOR" switch to the "10V" position and apply a known 10-volt calibration voltage. Adjust potentiometer R32 for full-scale deflection. It is not necessary to calibrate the remaining TVM ranges.

## WARRANTY

The CALIBRATION STANDARDS CORPORATION warrants each instrument to be free from defects in material and workmanship. The instrument must be returned to the factory with shipping prepaid and a complete report of the difficulty. This warranty is good for one year from the shipping date.

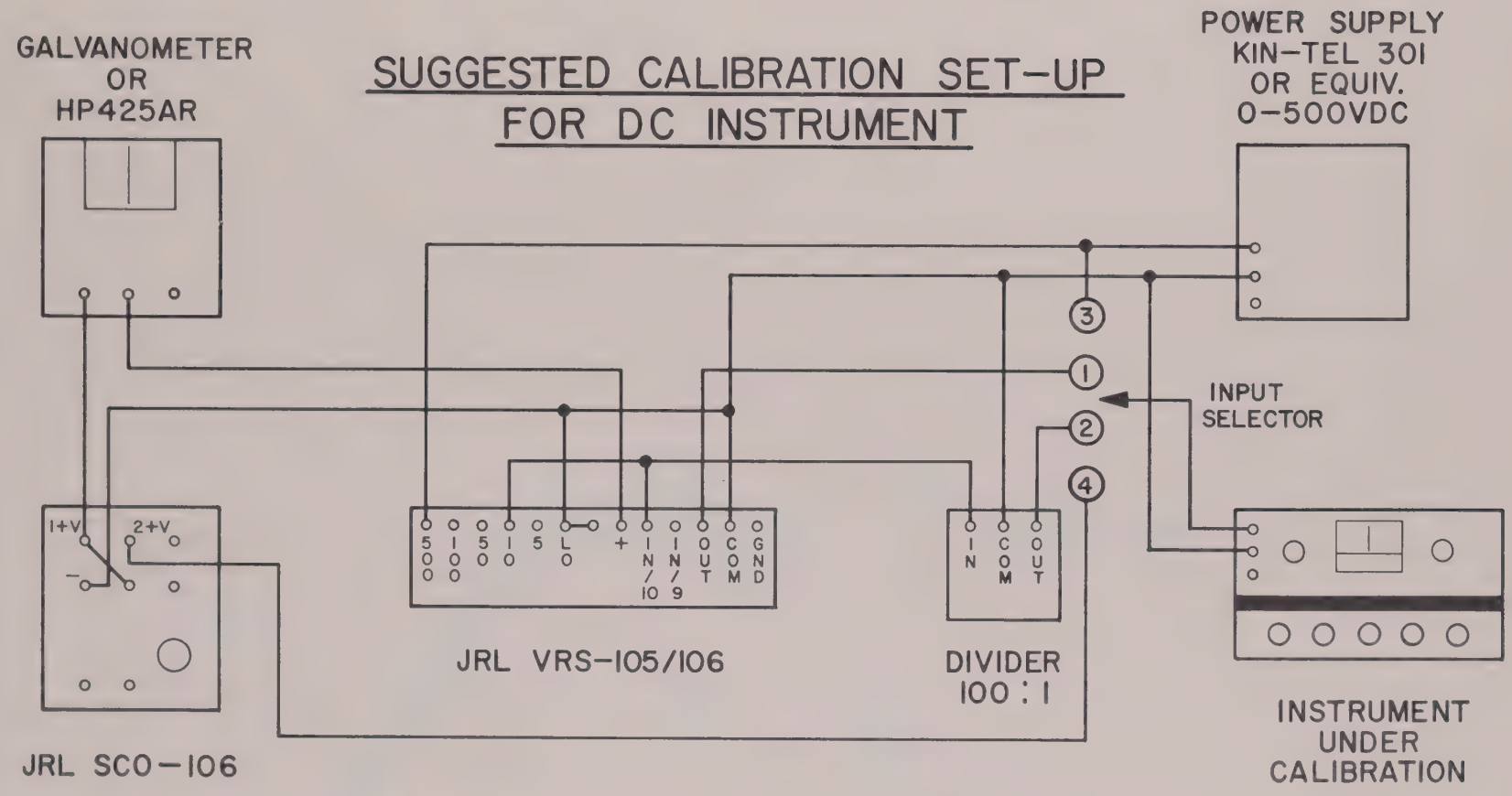
## SHIPPING DAMAGE

If there is any damage to the instrument upon receipt, report this to the transportation claim agent immediately.

JULIE RESEARCH LABS MODEL SCO-106 CELL ACCURACY 1-2PPM.

JULIE RESEARCH LABS MODEL VRS-105/106 ACCURACY 10PPM CALIBRATOR-10PPM RATIO.

# SUGGESTED CALIBRATION SET-UP FOR DC INSTRUMENT



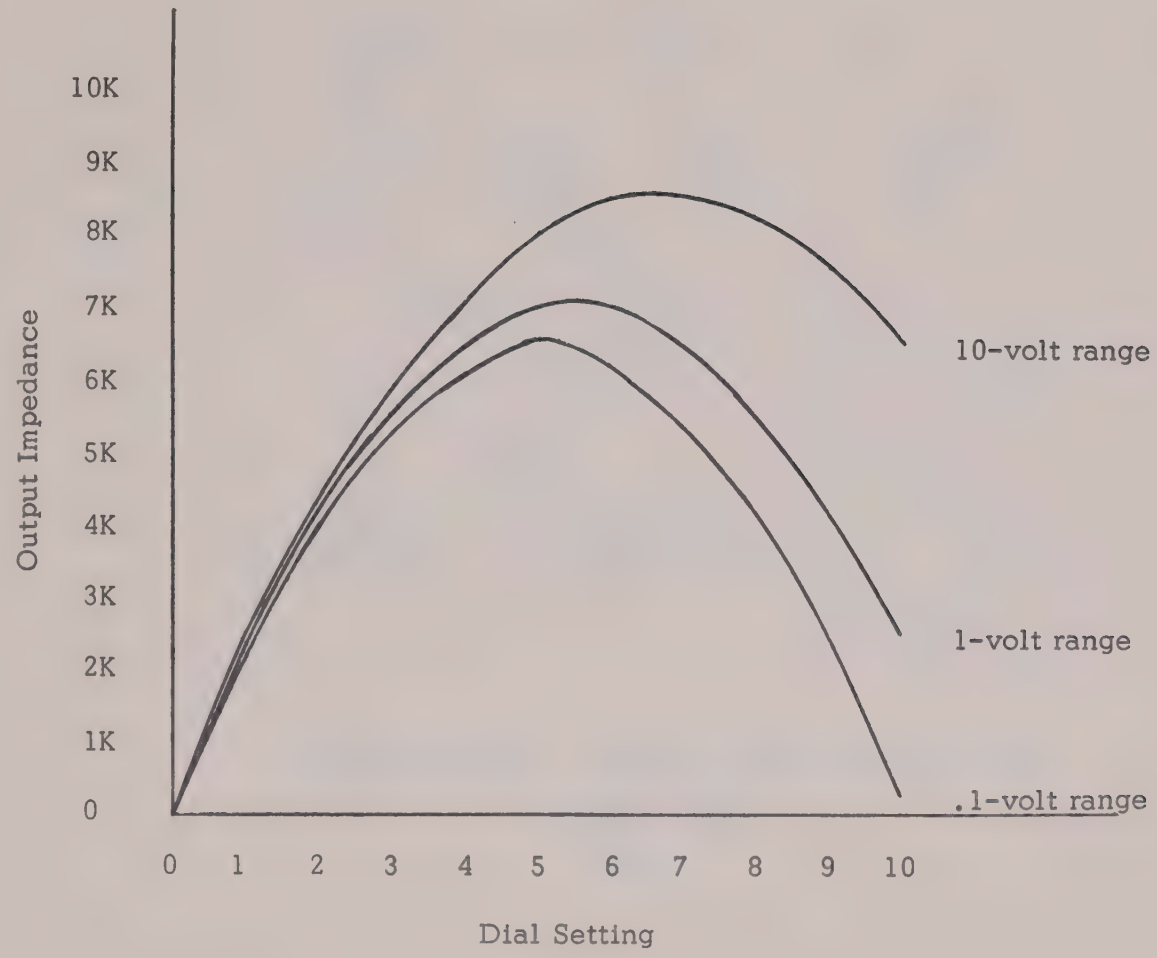

| RANGE | INPUT SELECT. | POWER SUPPLY | VRS RATIO | VRS 105 |
|---|---|---|---|---|
| 1000V | 3 | 500V | N. U. | 500V |
| 100V | 3 | 100V | N. U. | 100V |
| 10V | 4 | 10V | N. U. | 10V |
| 1.0V | 1 | 10V | 10 : 1 | 10V |
| 100MV | 2 | 10V | N. U. | 10V |

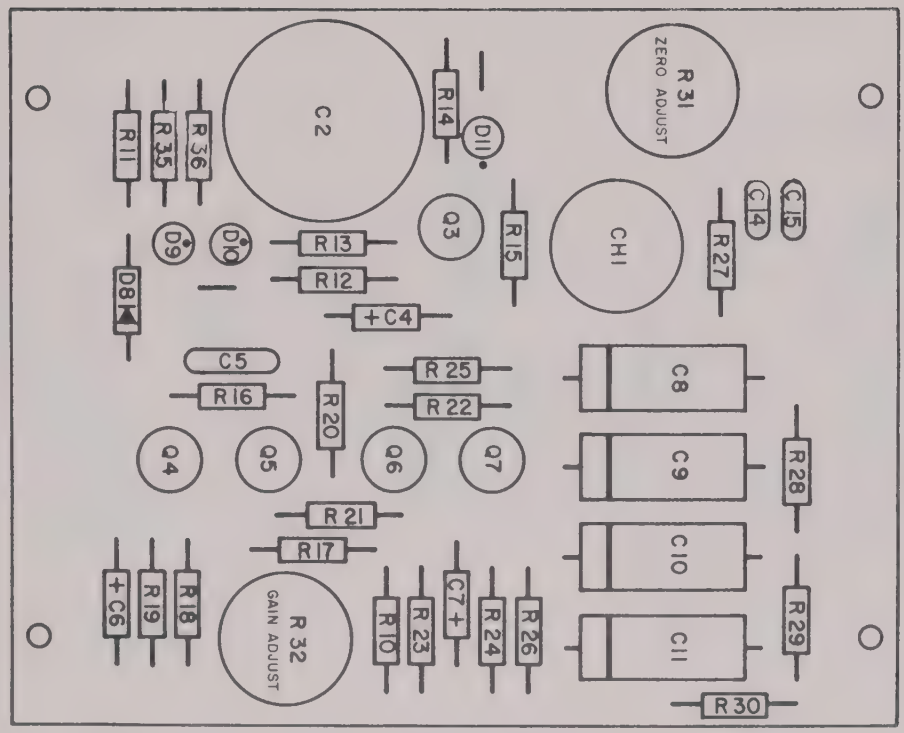
NOTES:

3. CARE SHOULD BE TAKEN WHEN OPERATING INSTRUMENT IN NEGATIVE MODE AS SHORTS MAY DAMAGE OR SHORTEN LIFE OF TEST EQUIPMENT.
2. FOR CALIBRATION OF 100MV RANGE DIVIDER SHOULD BE OF AT LEAST 20PPM ACCURACY.
1. FOR CALIBRATION OF 1.0V RANGE SET RATIO ON DIVIDER (JRL) TO 1.

OUTPUT IMPEDANCE OF REFERENCE OUTPUT

Models 100, 110, 150 Series Instruments

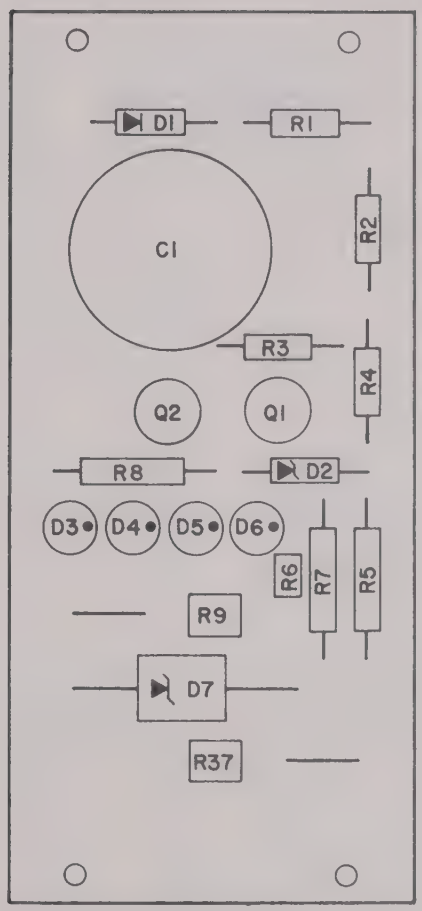





# COMPONENT LOCATION AMPLIFIER

## 400-106

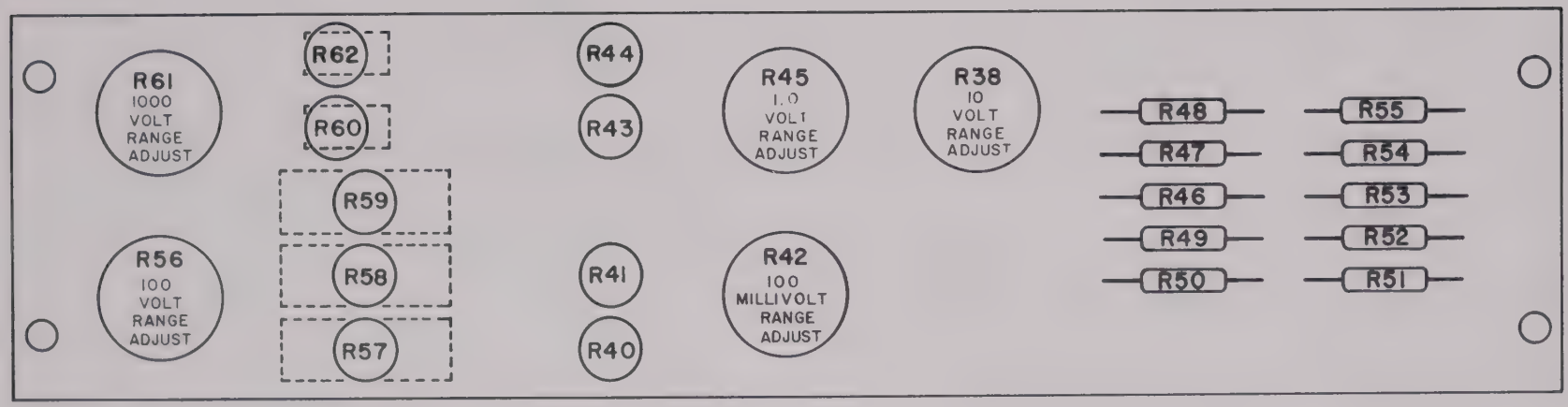
(REVISION A)




# COMPONENT LOCATION REFERENCE

## 400-107
## 400-124

(REVISION A)



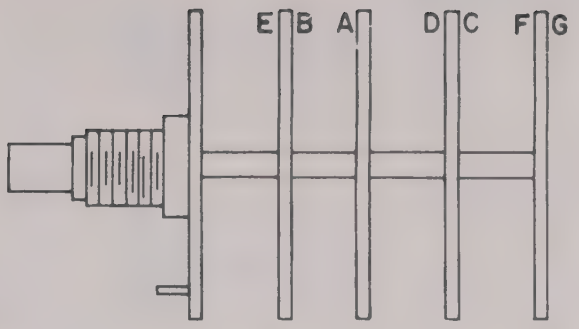

# COMPONENT LOCATION CALIBRATION

## 400—118

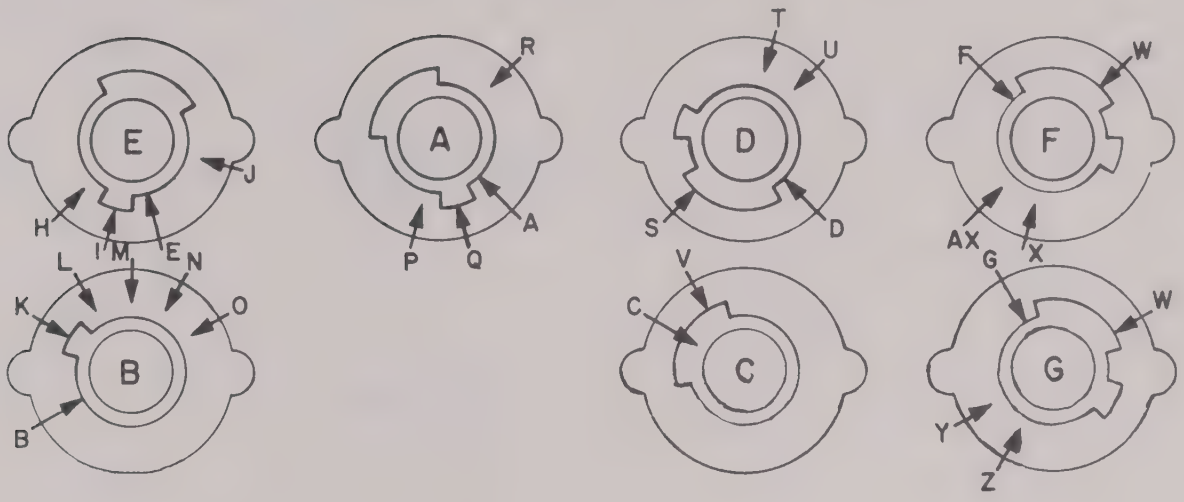
## 400—123

(REVISION A)

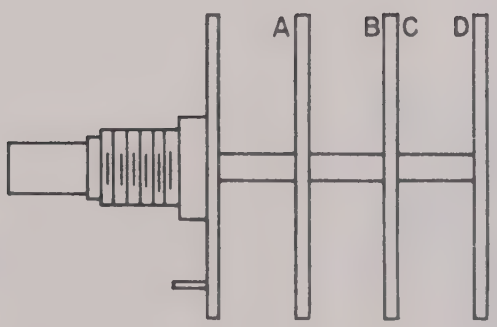
## S2



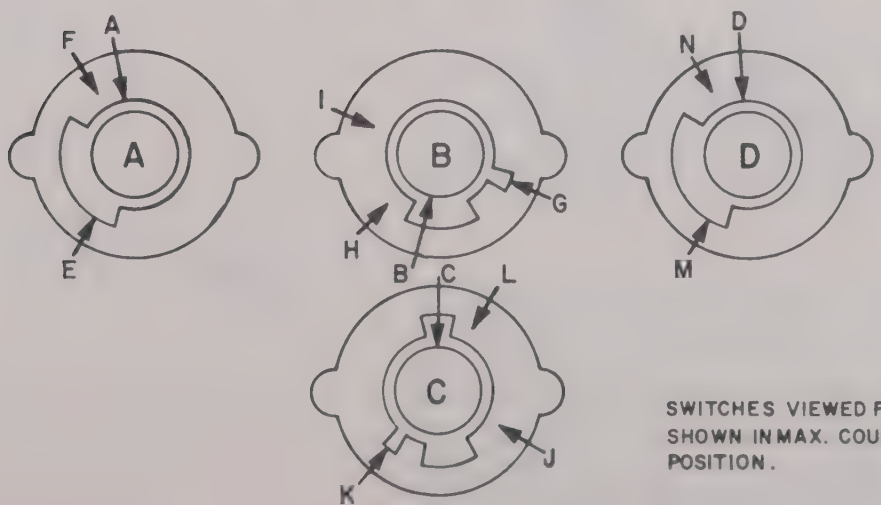

RANGE SWITCH
240—048



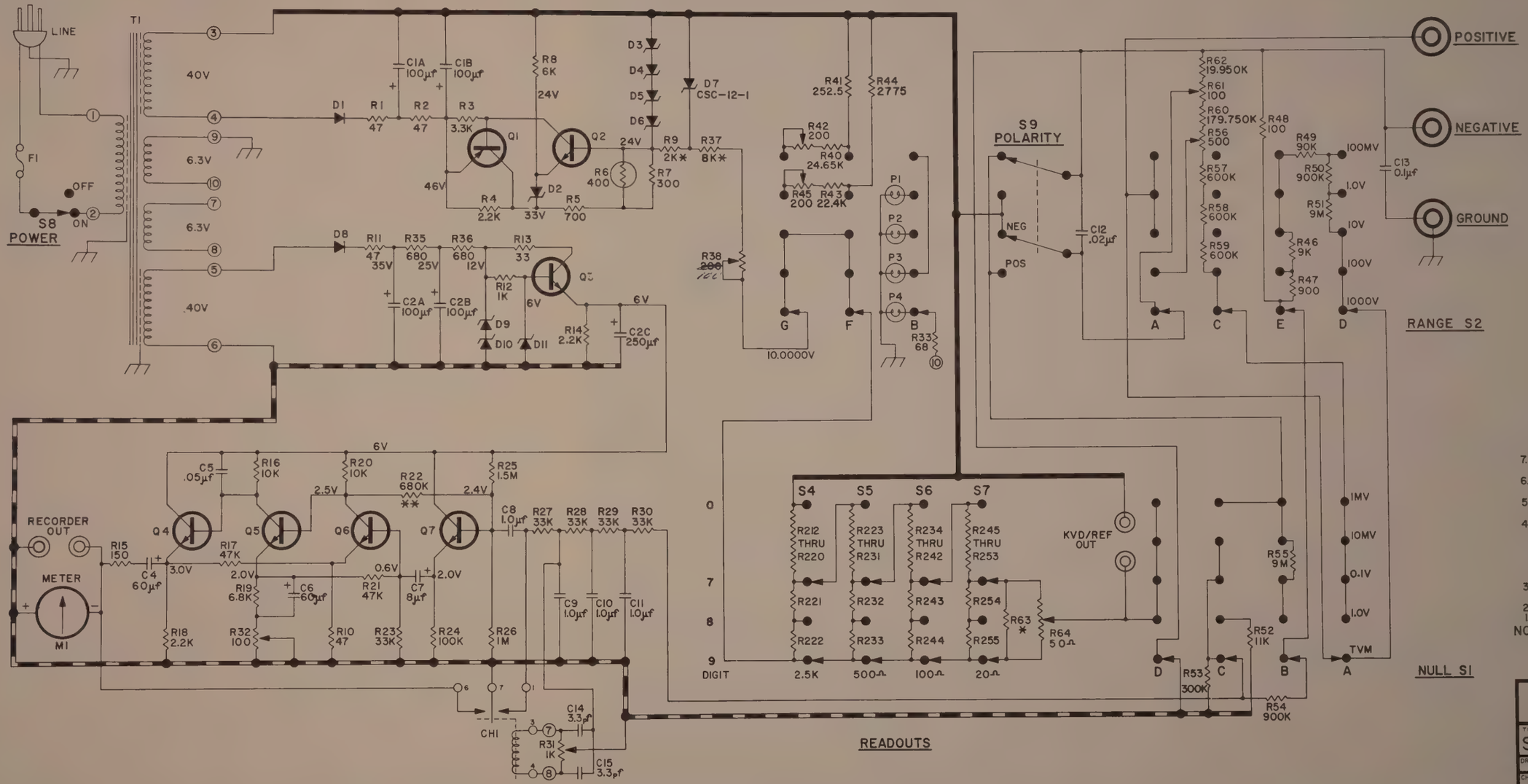

## S1




NULL SWITCH
240—044




SWITCHES VIEWED FROM KNOB END SHOWN IN MAX. COUNTER CLOCKWISE POSITION.




| REVISIONS | | | | |
|---|---|---|---|---|
| SYM | DESCRIPTION | EFF.S | DATE | APPD |
| | | | | |

7. ▬ INDICATES INSTRUMENT INPUT NEGATIVE BUSS.
6. ▬ INDICATES FLOATING AMPLIFIER NEGATIVE BUSS.
5. VOLTAGES MEASURED WITH 20,000Ω/V METER RELATIVE TO THEIR RESPECTIVE GROUNDS.
4. RANGE ADJUSTMENTS:

| | |
|---|---|
| 1000 VOLT | R61 |
| 100 VOLT | R56 |
| 10 VOLT | R38 |
| 1.0 VOLT | R45 |
| 100 MILLIVOLT | R42 |

3. ** APPROX. VALUE, SELECTED IN TEST, NOT USED IN ALL INSTRUMENTS.
2. * APPROX. VALUE, SELECTED IN TEST.
1. ALL RESISTORS ARE IN OHMS.

NOTES: UNLESS OTHERWISE SPECIFIED

CALIBRATION STANDARDS CORPORATION
ALHAMBRA — CALIFORNIA

| | | | |
|---|---|---|---|
| TITLE: SCHEMATIC DC-110B/BR | | | |
| DRAWN: C.A. Bill | DATE: 3 JULY 1963 | DRAWING NO. 340-126 | ISSUE |
| CHECKED: Bog | APPROVED: Bog | | |

## REPLACEMENT PARTS LIST

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| Reference Supply Sub-Assembly, 400-107 & 400-124 | | |
| R1, R2 | Resistor, FC, 47Ω, 10%, 1/2W | 201-470 |
| R3 | Resistor, FC, 3.3KΩ, 10%, 1/2W | 201-332 |
| R4 | Resistor, FC, 2.2KΩ, 10%, 1/2W | 201-222 |
| R5 | Resistor, DC, 700Ω, 1%, 1/2W | 205-032 |
| R6 | Resistor, NTC, 400Ω | 209-001 |
| R7 | Resistor, DC, 300Ω, 1%, 1/2W | 205-021 |
| R8 | Resistor, DC, 6KΩ, 1%, 1/2W | 205-042 |
| R9 | Resistor, Wire Wound | * |
| R37 | Resistor, Wire Wound | * |
| C1A, C1B | Capacitor, Dual Electrolytic, 100-100 mfd, 50 vdc | 222-013 |
| D1 | Diode | 216-025 |
| D2 | Zener Diode | 216-008 |
| D3, D4, D5, D6 | Zener Diode | 216-004C |
| D7 | Zener Diode, CSC 12-1 | * |
| Q1 | Transistor, PNP Silicon | 215-036A |
| Q2 | Transistor, NPN Silicon | 215-015A |
| 2 | Pad, Transistor | 218-004 |

REPLACEMENT PARTS LIST (Continued)

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| Amplifier Sub-Assembly, 400-106 | | |
| R10, R11 | Resistor, FC, 47Ω, 10%, 1/2W | 201-470 |
| R12 | Resistor, FC, 1KΩ, 10%, 1/2W | 201-102 |
| R13 | Resistor, FC, 33Ω, 10%, 1/2W | 201-330 |
| R14, R18 | Resistor, FC, 2.2KΩ, 10%, 1/2W | 201-222 |
| R15 | Resistor, FC, 150Ω, 10%, 1/2W | 201-151 |
| R16, R20 | Resistor, FC, 10KΩ, 10%, 1/2W | 201-103 |
| R17, R21 | Resistor, FC, 47KΩ, 10%, 1/2W | 201-473 |
| R19 | Resistor, FC, 6.8KΩ, 10%, 1/2W | 201-682 |
| R22 | Resistor, FC, 680KΩ, 10%, 1/2W | 201-684 |
| R23, R27, R28, R29, R30 | Resistor, FC, 33KΩ, 10%, 1/2W | 201-333 |
| R24 | Resistor, FC, 100KΩ, 10%, 1/2W | 201-104 |
| R25 | Resistor, FC, 1.5MΩ, 10%, 1/2W | 201-155 |
| R26 | Resistor, FC, 1.0MΩ, 10%, 1/2W | 201-105 |
| R35, R36 | Resistor, FC, 680Ω, 10%, 1/2W | 201-681 |
| R31 | Resistor, Variable, 1KΩ | 210-010 |
| R32 | Resistor, Variable, 200Ω | 210-009 |
| C2A, C2B, C2C | Capacitor, Triple Electrolytic, 100-100-250 mfd, 50-50 vdc | 222-014 |
| C4, C6 | Capacitor, Tantalum, 60 mfd, 6 vdc | 223-008 |
| C5 | Capacitor, Disc, .05 mfd, 75 vdc | 220-002 |
| C7 | Capacitor, Tantalum, 8.2 mfd, 20 vdc | 223-009 |

REPLACEMENT PARTS LIST (Continued)

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| Amplifier Sub-Assembly, 400-106 (continued) | | |
| C8, C9, C10, C11 | Capacitor, Mylar, 1 mfd, 100 vdc | 220-033 |
| D8 | Diode | 216-025 |
| D9, D10 | Zener Diode | 216-004C |
| D11 | Zener Diode | 216-004A |
| Q3, Q4, Q5, Q6, Q7 | Transistor, NPN Silicon | 215-015A |
| CH1 | Chopper | 230-004 |
| 5 | Pad, Transistor | 218-004 |
| 1 | Socket, 7-pin | 260-011 |
| C14, C15 | Capacitor, 3.3 mmf | 220-007 |

REPLACEMENT PARTS LIST (Continued)

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| Kelvin-Varley Divider, 2,500 ohm, Sub-Assembly, 400-116** | | |
| S4 | Switch, Rotary | 240-046 |
| R212-R222 | Resistor, WW, 2.5 ohm, .05%, 1/3 W | 203-132 |
| Kelvin-Varley Divider, 500 ohm, Sub-Assembly, 400-117** | | |
| S5 | Switch, Rotary | 240-046 |
| R223-R233 | Resistor, WW, 500 ohm, .05%, 1/3 W | 203-102 |
| Kelvin-Varley Divider, 100 ohm, Sub-Assembly, 400-110 | | |
| S6 | Switch, Rotary | 240-046 |
| R234-R244 | Resistor, WW, 100 ohm, .1% | 203-106 |
| Kelvin-Varley Divider, 20 ohm, Sub-Assembly, 400-111 | | |
| S7 | Switch, Rotary | 240-046 |
| R245-R255 | Resistor, WW, 20 ohm, .5% | 203-107 |
| R64 | Resistor, Variable, WW, 50 ohm | 210-016 |
| R63 | Resistor, FC, 10%, 1/2W | *** |

REPLACEMENT PARTS LIST

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| Calibration Board Sub-Assembly, 400-118 | | |
| R40 | Resistor, WW, 24.650KΩ, .05%, 1/3W | 203-002 |
| R41 | Resistor, WW, 252.5Ω, .05%, 1/3W | 203-003 |
| R43 | Resistor, WW, 22.400KΩ, .05%, 1/3W | 203-004 |
| R44 | Resistor, WW, 2.775KΩ, .05%, 1/3W | 203-005 |
| R46 | Resistor, DC, 9KΩ, 1%, 1/2W | 205-001 |
| R47 | Resistor, DC, 900Ω, 1%, 1/2W | 205-039 |
| R48 | Resistor, DC, 100Ω, 1%, 1/2W | 205-036 |
| R49 | Resistor, DC, 90KΩ, 1%, 1/2W | 205-004 |
| R50, R54 | Resistor, DC, 900KΩ, 1%, 1/2W | 205-002 |
| R51, R55 | Resistor, DC, 9MΩ, 1%, 1/2W | 205-005 |
| R52 | Resistor, DC, 11KΩ, 1%, 1/2W | 205-008 |
| R53 | Resistor, DC, 300KΩ, 1%, 1/2W | 205-009 |
| R57, R58, R59 | Resistor, WW, 600KΩ, .05%, 1/3W | 203-001 |
| R60 | Resistor, WW, 179.750KΩ, .1%, 1/3W | 203-062 |
| R62 | Resistor, WW, 19.950KΩ, .05%, 1/3W | 203-006 |
| R56 | Resistor, Variable, 500Ω | 210-012 |
| R42, R45 | Resistor, Variable, 200Ω | 210-009 |
| R61, R38 | Resistor, Variable, 100Ω | 210-011 |

REPLACEMENT PARTS LIST (Continued)

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| T1 | Power Transformer, 115 vac, 50-60 cps<br>Power Transformer, 230 vac, 50-60 cps | 235-014<br>235-016 |
| C12 | Capacitor, Disc, .02 mfd, 1K vdc | 220-001 |
| F1 | Fuse, 3 AG, 1/8 amp | 261-001 |
| 1 | Fuse Holder | 261-002 |
| 1 | Line Cord | 264-001 |
| 1 | Strain Relief | 283-001 |
| 4 | KVD Switch Readout Dial | 400-112 |
| 1 | KVD Pot Readout Dial | 400-113 |
| S1 | Switch, Rotary, Null | 240-044 |
| S2 | Switch, Rotary, Range | 240-048 |
| S8 | Switch, Toggle, SPST | 240-047 |
| S9 | Switch, Toggle, DPDT | 240-026 |
| M1 | Meter, 100-0-100 micro-amp | 250-008 |
| 1 | Bezel, meter | 250-009 |
| 1 | Terminal Post, Red | 263-105 |
| 2 | Terminal Post, Black | 263-106 |
| R33 | Resistor, FC, 68Ω, 10%, 1/2W | 201-680 |
| 4 | Lamp, Decimal | 400-114 |
| 2 | Knob, Range & Null | 214-010 |
| 5 | Knob, KVD | 214-011 |
| 1 | Cover, Instrument (B model only) | 310-080 |
| 1 | Handle, Instrument (B model only) | 285,004 |

REPLACEMENT PARTS LIST (Continued)

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| 4 | Feet, Rubber | 283-003 |
| 1 | Test Lead, Red | 264-003 |
| 1 | Test Lead, Black | 264-002 |
| C13 | Capacitor, 0.1 mfd, 1000 vdc | 220-040 |

NOTES

* (A) D7, the reference Zener diode, is carefully selected and stabilized by Calibration Standards Corporation. R9 is a precision wire wound resistor carefully selected to control the current through the reference diode, D7. R37 is a precision wire wound resistor, factory selected to drop the reference voltage from 13.5 ±5% vdc to 10.000 vdc. Failure of these components is extremely remote. It is recommended that the instrument be returned to the factory if a problem is suspected.

** (B) The resistors forming the Kelvin-Varley decks are factory matched to achieve an overall accuracy better than ±.005% absolute. When ordering, include instrument model and serial number.

*** (C) R64 is matched to the balance of the Kelvin-Varley divider by means of R63. R63 is factory selected and may vary in value from instrument to instrument.

# CALIBRATION STANDARDS CORPORATION

**AC & DC Voltmeters . . .**
**Accuracies to ±.005% + 5 microvolts**

**DC Voltage Calibrators . . .**
**Stability of ±.005%**

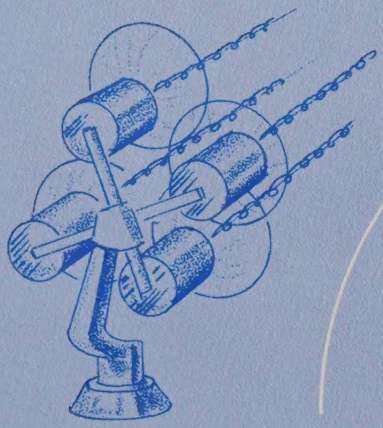
**DC Power Supplies . . .**
**Ranges from 0-2,111 to 0-20,000 VDC**

**AC/DC Converters . . . Voltage Ranges from .5 to 1,000 VAC**

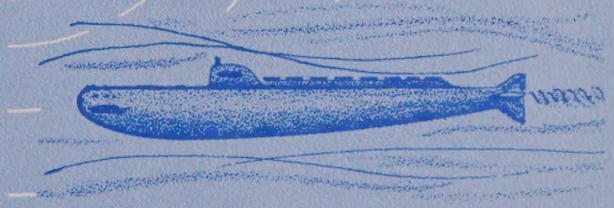
**High Voltage Dividers . . .**
**Stability of .005% per year**

**Combination Galvanometer, Power Supply and Wheatstone Bridges . . Absolute Accuracies to ±.025% +.003 ohm**

**Solid state Precision Voltage References . . . Accuracy of ±.005% at 25°C**



Model AC-150B-1 Precision AC Voltmeter



Model 120B Precision DC Power Supply

**PRECISION ELECTRONIC INSTRUMENTS FOR INDUSTRY**

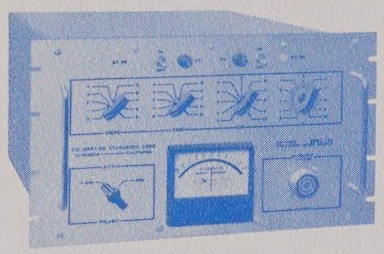
# CALIBRATION > STANDARDS

## PRECISION DC POWER SOURCES

*feature....*

**Temperature Compensation better than 20 ppm/°C, 10-40°C**
**In-line readout**
**Front panel polarity switch**

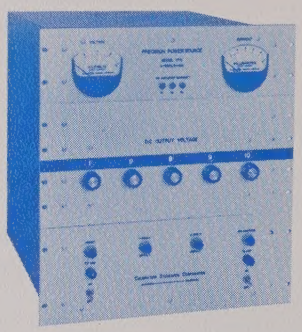
**Current and Voltage metering**
**Automatic Polarity indication lamps**
**Ability to be cycled repeatedly at any preset voltage without damage**



Model 134

Model 122B

Model 170



Model 120B

| Model | 120B | 122B | 133S | 134 | 127 (N or P) | 170 |
|---|---|---|---|---|---|---|
| Voltage Range | 0-2,111 VDC | 0-3,111 VDC | 0-6,000 VDC | 0-10,010 VDC | .5-3,000 VDC | 0-20,000 VDC |
| Current | 0-20 ma | 0-20 ma | 0-20 ma | 0-15 ma | 0-2 ma | 0-5 ma |
| Line reg. | .001% | .001% | .002% | .002% | .02% | .02% |
| Load reg. | .001% | .001% | .002% | .002% | .02% | .02% |
| Ripple | 1 mv p-p | 1 mv p-p | 1 mv rms | 1 mv rms | 5 mv rms | 1 Volt rms |
| Stability/hr | .005% | .005% | .005% | .005% | .02% | .1% |
| Stability/day | .02% | .02% | .02% | .02% | .03% | .3% |
| Accuracy | .25% | .25% | .25% | .25% | .5% | .25% |
| Resolution | 5 mv | 5 mv | 10 mv | 10 mv | 100 mv | 1 V |
| Panel Height | 3½" | 3½" | 7" | 10½" | 5¼" | 21" |
| Weight | 25 lbs | 30 lbs | 40 lbs | 85 lbs | 30 lbs | 200 lbs |
| Price | $410.00 | $540.00 | $675.00 | $1,075.00 | $345.00 | $3,250.00 |

**134B**
Current: 0-10 ma
Ripple: 5 mv rms
Price: $975.00


CALIBRATION>STANDARDS CORPORATION
1031 WESTMINSTER AVE.
POST OFFICE BOX 551
ALHAMBRA, CALIFORNIA

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